Regulated Efficiency, WTO Accession and the Motor Vehicle Sector in China

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Abstract: This paper is concerned with the interaction of regulated efficiency and WTO accession, and its impact on China's vehicle sector. The approach is general equilibrium using a 23x25 CGE model. Regulatory reform and internal restructuring are seen critical. Restructuring is represented here by a cost reduction following from consolidation and rationalization. This involves movement of costs toward global norms. Without restructuring, WTO accession means a surge of final, though imports of parts could well fall as production moves offshore. However, with restructuring, the final assembly industry can be made competitive by world standards, with a strengthened position for the industry.

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1. Introduction

Producing automobiles has often been a symbol of economic prestige in the developing world. Brazil, China, Indonesia, Malaysia and others have all promoted and sometimes even showcased the development of a domestic motor vehicle industry. In the case of China, with its huge population together with a surface area roughly as large as the United States' and almost 15% larger than Brazil's (see Table 1.1), almost every province in China has its own motor vehicle factory and satellite factories. But all this has done little more than to provide China with the largest number of people per vehicle among major economies in the world. Even Indonesia, with a 30% lower per capita income, has over 50% fewer people per automobile.

[Table 1.1 about here]

This has been "accomplished" through a series of policy measures dating back to the inception of the PRC (see Table 1.2). Further distorting an efficient structuring of the automobile industry have been internal measures, which limited and even prohibited trade through local protectionism (analogous to former Canadian inter-provincial trade restrictions). Government has also set prices and limited competition through a barrage of import restrictions, which included quotas, high tariffs and differential taxes that favor local suppliers. The limitation of trade has encouraged inefficient production and allowed for market segmentation.

[Table 1.2 about here]

The integration of Greater China into the WTO, and thus into most favored nation principles, has important implications for the Chinese economy, not least of all for the motor vehicle sector. For example, the accession agreements define major changes in tariffs, an elimination of quotas as well as local content requirements and in rules regarding foreign investment. There already has been a change in the perception of the market by outside investors, as the application of WTO-covered rules regarding treatment of foreign firms has

reduced uncertainty about the general economic climate, thereby inducing notable increases in investment and prompting new decisions to enter the market.

This paper is concerned with the impact of these broad changes on the Chinese motor vehicle sector. Emphasis is placed on the role of administratively imposed inefficiencies, i.e. so-called *regulated efficiency*, within the sector, and the role of such regulated efficiency in structural adjustment. The industry itself anticipates significant change. In recent years, growth in the sector has been very rapid, with output expanding at an annualized 13% in the four years ending in 1999, at a 26% rate in the three years to 2002 and more than double that in 2003. With new, modern plants having come on line in 2001 and 2002, and additional facilities expected to increase capacities by over 150% from 2002 to 2005, a large, discrete change in production levels is expected.

At the same time, WTO membership implies lower prices and steeper foreign competition in the sector. Response to this shift in the competitive landscape will be shaped by continuing problems with local government protection, lack of automobile infrastructure (roads, parking, service facilities, etc.), and related factors that act as constraints on growth of the sector. Even so, the industry itself expects continued strong growth. [1]

Notwithstanding industry expectations of its prospects, what can we really expect once the competitive landscape has changed in critical ways? The primary approach employed here to explore this question is general equilibrium, involving the application of a computational model. The next section (2) discusses some basic issues about the structure of the domestic motor vehicle industry, in particular the impact of government intervention on its efficiency. Following the overview of the auto sector is a brief discussion of the model framework (Section 3). This is followed by the experiments themselves in Section 4. Conclusions are offered in Section 5.

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[1] See for example China Online (2001). As WTO membership approached, the opinions of the industry and related ministries, as reflected in the Chinese press, hinged critically on whether or not restructuring of the domestic industry would be allowed to proceed. Hence a report in *Touzi Yu Hezuo* (summarized in China Online op. cit.) stressed expected injury to the industry, while the industry itself was at the same time indicating optimism that they could realize significant cost reductions, allowing them to remain competitive with imports (Feenstra et al. 2001). In the meantime price cuts by foreign producers in China have become commonplace, with some of them induced by increased import competition and others by more intense domestic competition. Buick, for instance, reduced its prices on its domestically produced models by 12%, while VW lowered Passat prices by 6.5% (indiacar.net, May 3, 2002). But even more importantly nearly all major foreign producers have announced plans to sizeably establish or rather increase production capacities. A recent major manufacturer to do so was DaimlerChyrsler in Sept. 2003, finally ratifying plans to establish facilities to produce C and E models in China (International Herald Tribune, Sept. 9, 2003).

2. The Mainland China Auto Industry

As a result of national and regional policies, China's motor vehicle industry is highly fragmented and inefficient by global standards. This was not only the result of the introduction of Soviet style industrialization beginning in the 1950s, where firms were merely production units and questions about efficiency irrelevant since it was the dictated output which mattered.[2] It was also the result of import substitution policies, together with cooperation agreements made with foreign companies beginning in the 1980's, which were meant to fill the increasing gap between the rapidly expanding demand for automobiles. After all, the major thrust of policies up until then had been to build trucks (see footnote 2). These trends are depicted in Figure 2.1

[Figure 2.1 about here]

The companies are thus operating with cost structures well within the global frontier. And the plants are producing considerably below global standards for efficient scale. This is illustrated in Table 2.1 for the sedan industry, knowing that plants of minimum efficient scale (MES) for final assembly of cars have been estimated to be greater than 200,000 units per year for the final assembly of one model.[3] China's entire sedan production in 1998 was 507,000 vehicles. These vehicles were produced in 13 factories. Of these, only two factories produced more than 100,000 sedans, implying fewer than 40,000 sedans per remaining factory.

There is actually a great deal of variation in plant scale around this average. This is shown in Table 2.1. The leading producer, Shanghai Volkswagen, made 279,000 sedans in

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[2] As noted by Zhang and Taylor (2001, pp. 261 ff), the FAW (First Automobile Works) provides ample evidence of the impact evolving from the various policies over the last 50 years. Between 1959 and 1981 the FAW produced "a mere 1542 units, an average 67 units per annum." In 1970 the production cost of a particular model (the CA72) were 220,000 yuan; but "the sales price was only 40,000 yuan…..In the absence of competition, all production units ran at low levels of productivity and efficiency…The legacy left by Mao's regime loomed well into the 1980s. By 1980 the number of automotive enterprises had risen to 2379, consisting of 56 vehicle manufacturers ..[producing inter alia] 5,418 cars".

[3] See Huang (2002, p. 543).

2002 (hence at MES levels if producing one model). Several plants had production runs of less than 20,000. In this sense, there are strong parallels to the situation in Mexico prior to NAFTA (see Lopez de Silanes, Markusen, and Rutherford 1994), where protected, inefficient factories operated well within the global technology frontier. Overall, the industry is characterized by roughly 2,400 industrial enterprises. In 1998, these included 122 motor vehicle manufacturing plants, 520 auto-refitting factories, 130 motorcycle factories, 62 car-engine factories and 1,589 auto and motorcycle spare-parts factories. Annual production capacity exceeds 2.3 million motor vehicles, and 10 million motorcycles. Since 1995, the general pattern has been closure of the smaller plants (generally relegated to the "other" category in Table 2.1), and expansion of production runs in the larger plants. With foreign investment and the rapid growth in the industry, the number of plants producing at least 25,000 vehicles has risen from 3 in 1995 to 11 in 2002.

[Table 2.1 about here]

Import and domestic shipment data in value terms are summarized in Table 2.2 below. (These data are for 1997, which serves as our "pre-accession" reference point.) Import tariff protection is summarized in Table 2.3. China's pre-accession average tariff on auto products (vehicles and parts) was 35%. The rate for vehicles averaged 70%, with sedans subject to tariffs of between 80% and 100%. Motor vehicle parts were subject to an average tariff of only 23% on average. Import shares were relatively low, averaging perhaps 3% in the years 1995–2002. Officially, only 20,000 sedans were imported[4]. Official policy encouraged the use of domestic parts, and better still locally-produced parts. In the case of new investments, domestic content rules applied, stipulating 80% domestic content by the third year. All this is reflected, as well, in the low share of automotive parts imports in total production. As concerns the ownership of companies, even after full implementation of the WTO foreign ownership will be limited to 50% agreements. [5]

[4] Unofficial estimates are that 100,000 or more sedans more have been imported into the country in recent years. Many of the smuggled cars tend to be luxury models.

[5] It might be noted that in the past finding partners meant often having to go to other provinces than those on the coast (see overview of policies). These provinces often tried to ensure that "buy local" conditions prevailed for local authorities. In the of taxis in Shanghai regulations "by chance" stipulated specifications which could only be filled by a VW model.

[Tables 2.2, 2.3 about here]

The tariff rates in the tables are scheduled to come down substantially. Tariffs are scheduled for a reduction to 25% for vehicles, and 10% for parts on an MFN basis as part of the WTO accession. In addition, quotas will be phased out by 2006, having been reduced by 15% per year up until then. Likewise domestic content requirements have already been removed. (Both of these non-tariff measures violate basic WTO rules.) Clearly, these changes in the structure of protection have significant implications for the structure of the automotive sector. Critically, other WTO obligations imply free movement of imported autos (free of import quotas) within the China market. This implies tremendous pressure for a breakdown of internal barriers for domestic production, and for a rationalization of the domestic industry. The internal barriers to trade simply cannot be sustained if China's new WTO obligations are to be taken seriously.

The government has itself realized this situation. Official and industry sources indicate an intention to support only a small number of domestic production groups, perhaps including: the Shanghai group (Volkswagen), China First Auto Works (Volkswagen), Shanghai GM (Buick), and the Dongfeng Group (Citroen). These groups with their foreign partners already account for over 70% of production in China. Such a sharp rationalization would undoubtedly be painful, but could allow the industry to consolidate production and work its way down the average cost curve for vehicle production.

3. The Modeling Framework

In the next section, we sketch a quantitative assessment of the possible impact of WTO accession. This involves the application of a computation-based economic model (known as a "computable general equilibrium" or CGE model) to assess the impact of the Greater China's accession to the WTO. We provide a brief overview of the model in this section. More technical details and references are provided in Francois and Spinanger (2001), and in the

technical annex available for download with the model files.[6] For multi-sector policy initiatives (like WTO accession), the use of computable general equilibrium (CGE) models has become a relatively standard approach (see Francois 2000). While the results of these exercises are hampered both by the assumptions and the quality of the data available, their utility in estimating the possible overall pattern of impact of broad policy changes – i.e. both of a direct and indirect nature – has proved to be helpful in policy formulation and the assessment of existing economic policies.

3.1 The Model Data

The data come from a number of sources. These have been organized into 23 sectors and 25 regions. Note that we have included some detail on the value added chain linking fibers into textiles and clothing production, to better capture the initial impact of the Agreement on Textiles and Clothing (ATC) on our base scenario. The ATC is scheduled to phase out remaining textile and clothing quotas by 2005. The sectors and regions for this 23x25 aggregation of the data are detailed in Table 3.1.

[Table 3.1 about here]

Data on production and trade are based on national accounting data linked through trade flows and drawn directly from the Global Trade Analysis Project (GTAP) version 5 dataset (McDougall 2001). The GTAP version 5 dataset is benchmarked to 1997, and includes detailed national input-output, trade, and final demand structures. Modifications have been made to the basic database. In particular, we have updated the dataset to better reflect actual import protection for goods and services.

Basic data on current tariff rates come from UNCTAD and WTO data on the schedules of applied and bound tariff rates. These are integrated into the core GTAP database. They are supplemented with data from the Office of the US Trade Representative and the US International Trade Commission on regional preference schemes in the Western Hemisphere. For agriculture, protection is based on OECD and USDA estimates of agricultural protection, as integrated into the GTAP core database. Tariff and non-tariff barrier estimates are further adjusted to reflect remaining Uruguay Round commitments, including the phase-out of

[6] The model files themselves, along with the technical annex describing the model, can be downloaded from http://www.intereconomics.com/francois. The model is implemented in GEMPACK.

remaining textile and clothing quotas under the Agreement on Textiles and Clothing (the ATC). Data on post-Uruguay Round tariffs are taken from recent estimates reported by Francois and Strutt (1999). These are taken primarily from the WTO's integrated database, with supplemental information from the World Bank's recent assessment of detailed pre- and post-Uruguay Round tariff schedules. All of this tariff information has been matched to the current model sectors. Services trade barriers are based on the estimates as described in the technical annex, and are shown in Table 3.2 (the basic GTAP database includes no information at all on trade barriers for services, for example).

[Table 3.2 about here]

While the basic GTAP dataset is benchmarked to 1997, and reflects applied tariffs actually in place in 1997, we of course want to work with a representation of a post-Uruguay Round world. To accomplish this, before conducting any policy experiments we first run a "pre-experiment" in which we implement the remaining Uruguay Round tariff cuts. Most of these cuts are already in place in the 1997-benchmark dataset. At the same time, the data are also adjusted to reflect regional preference schemes in Latin America (not represented in the core GTAP database). The dataset we work with for actual experiments is therefore a representation of a notional world economy (with values in 1997 dollars) wherein we have full Uruguay Round tariff cut implementation. We then examine both the ATC phase-out, and Greater China accession, with reference to this post-UR tariff benchmark.

3.2 Model Structure

We turn next to the basic analytical features of the model. Outside automobiles, we use a very standard CGE model structure. On the production side all sectors firms minimize costs, employing domestic production factors (capital, labor and land) and intermediate inputs from domestic and foreign sources to produce goods and services. These technologies are modeled as CES processes defined over primary inputs, and Leontief processes over intermediate inputs. Products from different regions are assumed to be imperfect substitutes in accordance with the so-called "Armington" assumption. Prices on goods and factors adjust until all markets are simultaneously in (general) equilibrium. This means that we solve for equilibria in which all markets clear. While we model changes in gross trade flows, we do not model

changes in net international capital flows. (This does not by any means preclude changes the level of gross capital flows.) Trade liberalization in the goods sectors involves the reduction of tariffs. This involves a shift from model base rates in Table 3.2 to the new bound rates. Note that these are generally quite close to our calculations of average accession rates, also shown in Table 3.2. Service sector liberalization is modeled as a reduction in trading costs, reflecting the barrier reductions reported in Table 3.2. These are Samuelson iceberg costs.

For the motor vehicle sector, we want to reflect the status quo in a stylized, though representative, way. One option is to implement imperfect competition in the model. However, this does not really reflect the primary issue at hand. As a result of government policy, there is certainly market segmentation. There is also price setting and regulation. While it is ultimately something of a judgment call, we have chosen to focus on realized cost efficiency for the sector. The current cost structure of the industry reflects the net effect of a basket of policies. Like clothing in India, or automobiles in Mexico pre-NAFTA, the structure of the auto sector in China reflects *regulated efficiency*. By this term, we mean industry structure reflecting the impact of the general regulatory and administrative environment. The critical issue is actually these collective inefficiencies, which follow from the full set of industrial policies. At the same time, an implication of intended public policy seems to be restructuring and consolidation, leading to an improvement in regulated efficiency.

What shape will regulated efficiency gains take? The industry, through rationalization, may collectively move down relevant cost curves. A comparison of current plant scale (Table 2.1) with a global norm closer to 350,000 units per plant implies that average costs are roughly 20% higher simply because of inefficient scale.[7] Data from interviews with industry (Feenstra et al. 2001) point to similar cost savings, with expectations even higher, in the range of 25% to 30% cost reductions. Last but not least The World Bank (1993, p. 57) described quite succinctly the expected gains from reaching MES: "If this cost-volume relationship is applied to the Chinese automotive industry, the passenger car segment has a

[7] The 20% figure is based on the distribution of current plants in Table 2.1. If we apply the formula $\Delta \ln(Average\,Cost) = CDR \times \Delta \ln(Quantity)$, where CDR is the inverse elasticity of scale, defined as $CDR = - \frac{Average\,Cost - Marginal\,Cost}{Average\,Cost}$, and where CDR is between .125 and .135 (the range of values found in engineering studies), we can calculate an average cost index for the industry. If such an index is 100 at 350,000 units per plant, current plant structure yields a cost index of roughly 120.

cost disadvantage of 20 to 30 percent compared with the international producers having MES. This cost disadvantage could be an understatement, however, as there are already eight producers in the market….".

This net cost effect is stressed here, and sets the treatment of motor vehicles apart from other sectors in the model. We work with the lower bound of these cost effect estimates. In particular, we focus on potential cost savings in the final assembly of autos (due to consolidation and rationalization of policy, and yielding a higher regulated efficiency level for the industry).[8] In addition, the differential treatment of parts and finished vehicles in the tariff schedule will also be tracked.

[Figure 3.1 about here]

Finally, for comparison, we draw on developments in the automobile industry at an earlier point in time, which fit quite well to the overall state of the automotive sector in China and the hypothesized impact of major efficiency changes. That large gains can be achieved in rationalizing production and accordingly reducing costs was most clearly demonstrated towards the beginning of the 20th century in the United States. In 1914, "13,000 workers at Ford were producing 260,720 cars. By comparison, in the rest of the industry, it took 66,350 workers to make 286,770" cars.[9] One could also come up with such dichotomies across the spectrum of production possibilities in China today, with new foreign-built modern plants coexisting with Mao era facilities. In addition to the shift in cost parameters that occurred back then, similar demand factors prevailed. Cars in the U.S., as a result of Ford's new production methods, moved from being scarce good, to one affordable by large segments of the population. China is already in the process of moving into this phase. A glance at Figure 3.1 would seem to justify such an analogy.

[8] It should be noted that MES calculations for motor parts are subjected to higher levels.

[9] See http://inventors.about.com/gi/dynamic/offsite.htm?site=http://www.wiley.com/products/subject/business/forbes/ford.html.

4. Experiments and Results

The experiments involve full accession for Greater China (Mainland China and Chinese Taipei). The basic accession package involves the changes in tariffs detailed in Table 3.2. For automobiles, we model the following effects:

- Tariffs on motor vehicles will decrease to 25%.
- Tariffs on auto parts will be phased down from an average of 23.4% to an average of 10%.
- Industry rationalization. Implicitly, this involves the elimination of internal, regional barriers. It allows for consolidation and rationalization within the domestic market. Small, inefficient factories will close. To quantify this effect, we take sedan production as representative. Given the typical scale of domestic production, we make the approximation that auto plants may realize a 20 percent cost savings in assembly if we move plants to efficient scale. (See footnote 2 and the discussion in Section 3). This savings is modeled at the assembly level.

Overall sectoral impacts of the experiments are presented in Table 4.1. This table reports changes in the quantity of output under our alternative scenarios. Hence, as expected, we see that the extension of the ATC phase-out to China and Chinese Taipei implies a rather dramatic expansion of the textile and clothing sectors. These sectors grow at 13.9 and 50.3 percent. There are important general equilibrium effects, as the resources needed for this experiment are drawn from other parts of the economy, including the motor vehicle sector.

[Table 4.1 about here]

What is very important for the motor vehicle sector is the next set of results in Table 4.1, namely in columns B and C. These reflect the incremental impact of China's market access commitments made as part of accession. Column B is a "business as usual" scenario, without the restructuring discussed elsewhere in the paper. It reflects a domestic motor vehicle industry that continues to be fragmented, with favored producers in each region, small production runs, and high costs. Such an industry is simply unable to compete with imports. It is hit very hard by imports, with domestic production falling 36.7 percent.

Combined with the initial impact of the ATC phase out, we see a rather dramatic retrenchment of the uncompetitive domestic industry in the face of imports in Column D.

The contrast is offered in column C, and the corresponding total in column E. In column C, we have the elimination of internal barriers, rationalization of plants (with smaller plants being closed) and a realized efficiency gain of roughly 20% as scale economies are realized. This industry is much different from the one in column B. Production actually goes up slightly (3%) in total, and the industry emerges as a relatively competitive one, despite the loss of protection.

[Tables 4.2, 4.3 about here]

More information is provided on the differences between the two scenarios in Tables 4.2 and 4.3. The Table 4.2 expands on the information originally provided in Table 2.2, with a comparable breakdown corresponding to columns D and E in Table 4.1, which portrays the output results. The most striking difference between the two scenarios is the different impacts on intermediate parts production, and final auto production. This is illustrated in Table 4.2. Under the first scenario, characterized by a domestic policy status quo, imports of parts rise slightly, while their share of the domestic parts market rises substantially. At the same time, there is a dramatic surge in imports of motor vehicles, which displace more than one-third of existing domestic production. There is a drop in the overall market for parts, because of the decline in domestic vehicle production. Recall that, under our second scenario, the final assembly sector is rationalized, allowing the sector to then compete more directly with imports. We then see a shift to imported intermediates (rising to a market share of over 50%), a fall in domestic parts production (as they are displaced by imports), but a steady overall demand for parts. For the industry overall, while ground is still lost to parts imports, sales of domestic vehicles remain relatively steady in the face of imports.

One last view on the effect of accession relates to value added and trade. It is logical to expect some export response, both because of the general liberalization in trade, and because pressure from imports may force firms to seek other markets. China exports less that 4 percent of its production in the sector, based on 1997 values. Of $32 billion in production, only $1.3 billion is exported. To put this into perspective, Australia has a comparable level of exports, with an industry only one-third the size of the Chinese industry. The export share for

Korea is 10 times as large. China's trade is therefore well below global integration standards, measured by exports. In our experiments, we find that restructuring accelerates the export orientation of the industry, with a rapid growth in exports. This is shown in Table 4.3. Exports rise by roughly 300% in percent terms, and $3.8 billion in value terms, reaching roughly 10% of production by value. While this seems dramatic, it needs to be kept in perspective. Automobiles and parts are a small share of exports currently (0.6 percent in 1997), and remain small (up to 2 percent) even with the growth in automobile exports. In addition, most of the restructuring remains focused on the domestic market.

5. Summary and Conclusions

This paper is concerned with the interaction of regulated efficiency and the WTO accession of China, and its impact on China's motor vehicle sector. The approach is general equilibrium, involving the application of a global general equilibrium model. It is argued that regulatory reform and internal restructuring are critical to any realized impact on the sector. Such a restructuring is represented here by a cost reduction following from consolidation and rationalization. This representation is supported by a comparison of scale in a typical auto plant in China to ones in North America or Europe, and also by firm survey responses. We also drew on earlier similar estimates of benefits to be made by achieving MES and by radically structuring production more efficiently. The net result involves movement of costs toward global norms. Without such restructuring, the domestic industry remains uncompetitive, and WTO accession means that imports of final vehicles will surge, though imports of parts will fall as production moves offshore. However, with restructuring, the final assembly industry can be made competitive by world standards, while the parts industry further integrates with the global industry through exports (and through higher imports of parts). And as can be seen in Figure 5.1 the automobile industry is well poised along the coast to take advantage of global markets.

[Figure 5.1 about here]

Viewed in total, what do our results tell us? The model results highlight the importance of the impact of regulatory regimes on costs for the impact of trade policy changes. In the

present context, restructuring within the domestic market means a qualitatively different impact from tariff reductions. Without such restructuring, the industry fails to compete and contracts dramatically. However, with restructuring, the final assembly industry can be made competitive by world standards. In addition, with restructuring, the basic character of the industry shifts to local assembly, with high import content for domestic vehicles.

Two additional issues need to be raised. First, as seen in Table 1.1, China's population to motor vehicles ratio is far higher than in many other countries with similar income levels. Since this reflects the impact of the existing policies, significantly changing these policies will thus shift the demand back to what could be viewed as a normal pattern of consumption of cars, given China's geographic attributes. Secondly, further strengthening the demand for cars could be the improved access to car financing. Whereas roughly 75% of US and European automobile purchases are financed through loans, only 15% of car purchases in China are financed this way. While China's protocol of accession to the WTO stipulates that automobile finance will be liberalized, only draft legislation has been presented to date.[10] To the extent that this potential can be tapped the pressure on the firms to be more productive and thus more competitive will be all the greater. This would be another factor helping ensure that the welfare gains calculated will come about.

The shortcomings of the analysis also need to be highlighted. We have worked with a very stylized model, even though we feel it widely captures the real world we are dealing with. While restructuring has positive overall implications for the industry, there will clearly be adjustment costs not pointed to the in the model. Even if value added is preserved within the sector, there will most likely be dramatic relocation of jobs toward a limited number of plants, with job losses in the other, smaller plants. The current regional scattering of final auto production (Table 5.1) will be replaced by a more geographically concentrated pattern. At the same time, parts production will also tend to concentrate. To the extent parts suppliers are able to supply regional markets, this is likely to mean an intensification of the clustering in the coastal regions, with parts shipments to Japan, Korea, the US and other regional centers of production.[11] Overall, a relatively large share of value added is kept intact with

[10] Nonetheless, some major car companies (VW and Ford) did reach agreements with Chinese banks earlier this year (KPMG, 2003, p. 7). According to the *International Herald Tribune* (October 6, 2003) China has opened up this sector in line with its WTO commitments.

[11] Already European manufacturers have established 12 plants in China and one large American company Delphi) is shifting from Mexico

restructuring. From an employment perspective, output and value added results closely track the impact on employment. Our results point to a range of effects from –40 percent (without restructuring) to –3 percent (with restructuring) on auto sector employment. *Needless to say*, it is essential that the structure of plants be rationalized.

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Table 1.1
GNP, Population and Stocks of Cars in Selected Countries – 2000

	PPP GNP p.c. $ 2002	Population mill. 2001	Stocks of cars / trucks mill. 2001		People per car	Surface Area 1000sq km l
India	2570	1032.4	6.3 /	5.9	163.2	3287
Indonesia	2990	209.0	3.0 /	2.4	68.8	1905
China	**4390**	**1271.8**	**8.5 /**	**15.4**	**149.0**	**9598**
Colombia	5870	43.0	1.8 /	0.8	23.4	1139
Turkey	6120	66.2	4.5 /	1.6	14.6	775
Thailand	6680	61.2	2.9 /	4.1	21.4	513
Brazil	7250	172.4	15.8 /	4.0	10.9	8547
Russia	7820	144.8	21.2 /	5.1	6.8	17075
Malaysia	8280	23.8	4.2 /	1.0	5.6	330
Mexico	8540	99.4	12.2 /	5.6	8.2	1958
South Africa	9870	43.2	41.0 /	2.5	1.1	1221
Argentina	9930	37.5	5.4 /	1.6	7.0	2780
Republic of Korea	16480	47.3	8.9 /	4.0	5.3	99
Chinese Taipei	17730	22.4	4.8 /	0.9	4.6	36
Spain	20460	41.1	18.2 /	4.2	2.3	506
Italy	25320	57.9	33.2 /	3.8	1.7	301
United Kingdom	25870	58.8	27.8 /	3.4	2.1	243
Japan	26070	127.0	53.5 /	19.9	2.4	378
France	26180	59.2	28.7 /	5.9	2.1	552
Germany	26220	82.3	44.4 /	3.6	1.9	357
Canada	28070	31.1	17.1 /	0.7	1.8	9971
United States	35060	285.3	128.7 /	88.0	2.2	9629
Total	**9224**	**4017.1**	**492.2** /	**184.3**	**8.2**	**71200**
Low & middle income	4682	3274.4	140.6 /	54.9	23.3	49263
High income	29248	742.7	351.6 /	129.4	2.1	21937

Sources: World Development Indicators; Verband der Automobilindustrie.

Table 1.2:
Summary of Developments in the Chinese Automotive Sector

1953-65: Self-reliance Policy

Roughly 60,000 vehicles produced per year .
Relied on Soviet technologies.
No other international contacts.
Provincial governments set up production units.
By 1960 16 auto producers and 28 assembly companies.

1966-80: Security Oriented

Government invested heavily in western regions (Sichuan, Shanxi and Hubei).
Remote locations caused severe problems and over capacity.
Focus was on heavy vehicles for military purposes.
Car demand increased rapidly and capacities were expanded to 160,000 units/year.
By 1980 58 carmakers, 192 assembly companies and 2000 spare parts producers.

1981-98: Initial Fruits of Open-door Policy

Open-door policy in 1978 kick-started industry.
From 83 – 85 noumber of companies almost doubled from 65 to 114 units.
By 1998 roughly 2500 production units.
Provincial governments further regionalized production.
Major international firms began to invest and then towards end quite rapidly.
VW had already started in 1978.
These joint ventures accounted for about 60% of production in period

1999-??: Opening Up and Beyond

Major investments by foreign companies.
All major Japanese companies in China.
All major Germany producers in China.
French and Italian producers nominally present.
US producers also nominally present.
Currently rapid expansion. Capacity now near 2.5 mill. units.
Growing capacity developed in costal areas

Source: from numerous publications.

Table 2.1
Auto Plants in China, number of cars produced by plant

Rank 2002/1995	plant	1995	1996	1997	1998	1999	2000	2001	2002*
1/1	Shanghai-VW	160,070	200,222	230,443	235,000	230,946	221,524	230,378	248,000
2/4	FAW-VW	24,553	44,825	46,405	66,000	81,464	94,147	101,622	131,000
3/NA	Shanghai-GM	–	–	–	–	–	30,024	58,548	106,000
4/2	Tianjin Xiali (Daihatsu)	65,258	88,232	95,155	100,021	101,828	81,951	41,703	93,000
5/5	FAW-Audi-Hongqi	19,350			15,000	15,731	31,225	52,667	78,000
6/9	Shenlong (Citro'n)	3,797	9,228	30,035	36,240	40,200	53,900	52,850	68,000
7/6	Chang'an (Suzuki)	17,770	16,420	35,160	36,239	44,583	48,235	50,573	64,000
8/NA	Guangzhou-Honda	–	–	–	2,246	10,008	32,228	51,153	60,000
9/NA	Shanghai-Qirui	–	–	–	–	–	2,767	30,085	47,000
10/NA	Geely Group	–	–	–	–	–	14,594	21,702	38,000
11/NA	Dongfeng Fengshen	–	–	–	–	–	3,159	8,000	32,000
12/NA	Haima (Nainan-Mazda)	–	–	–	–	–	3,059	7,800	20,000
13/NA	Yuedo-KIA	–	–	–	–	–	2,423	6,210	16,000
14/NA	Qinchuan	–	–	–	–	–	5,380	5,686	16,000
15/NA	Nanya	–	–	–	–	–	1,000	8,000	13,500
16/3	Beijing (Jeep)	25,127	26,051	19,377	8,344	9,294	4,867	4,663	4,400
17/7	Guizhou Yunque (Subaru)	7,105	798	1,000	–	–	859	1,253	2,100
18/NA	Tianjin-Toyota	–	–	–	–	–	–	–	2,000
NA/8	Guangzhou-Peugeot	6,698	2,416	1,557	–	–	–	–	–
	Other	22,570	–	22,479	8,013	31,312	17,930	–	1,900
	Total	352,298	388,192	481,611	507,103	565,366	649,272	732,883	1,040,900
	Number of plants > 25,000	3	4	5	5	5	8	9	11
	Number of plants > 50,000	2	2	2	3	3	4	7	8
	Number of plants > 100,000	1	1	1	2	2	1	2	3

* 2002 values are based on company projections.

Sources: F. Bessum (2002); Chinese Motor Vehicle Documentation Center (2002).

Table 2.2
The Mainland China Motor Vehicle Industry, 1997
(millions of US dollars)

Imported motor vehicles and parts, world prices	3,607.71
Imported motor vehicles and parts, internal prices	4,849.31
imported parts, internal prices	3,239.45
imported motor vehicles, internal prices	1,609.86
Domestic intermediates and parts	32,812.46
domestic intermediate parts	10,896.15
industry consumption of motor vehicles	21,625.5
final consumption of motor vehicles	290.81

Source: GTAP version 5 database.

Table 2.3
Tariffs on Motor Vehicles

	current rates	final rates
finished motor vehicles	70.50%	25%
motor vehicle parts	23.40%	10%
electronic parts	12.00%	10%
AVERAGE vehicles and parts	34.70%	15%

Source: China WTO accession schedule, GTAP data, and Office of the US Trade Representative.

Table 3.1
The Regional and Sectoral Breakdown of the Model

Regions	***Sectors***	
Hong Kong	Primary:	Wool
People's Republic of China		Natural fibers (cotton etc.)
Chinese Taipei		Primary food production
Japan		Other primary production
Korea		Sugar
ASEAN5 member states[a]		Processed food, tobacco, and beverages
Vietnam		
India	Manufacturing:	Textiles
Bangladesh		Wearing apparel
Other South Asian economies[b]		Leather products
Australia		Chemicals, refinery products, rubber, plastics
New Zealand		Steel refinery products
Canada		Non-ferrous metal products
United States of America		Motor vehicles and parts
Mexico		Electronic machinery and equipment
Brazil		Other machinery and equipment
MERCOSUR[c]		Other manufactured goods
Caribbean Basin Initiative economies[d]		
Andean Trade Pact economies[d]	Services:	Wholesale and retail trade services
Chile[d]		Transportation services (land, water, air)
Other Latin America[d]		Communications services
European Union, 15 economies.		Construction
Turkey		Finance, insurance, and real estate services
Africa and the Middle East		Other commercial services
Rest of World		Other services (public, health, etc.)

[a]ASEAN5 includes Philippines, Thailand, Indonesia, Singapore, and Malaysia. – [b]Pakistan, Sri Lanka, Nepal. –

[c]MERCUSOR includes Argentina, Paraguay, Uruguay. Brazil is represented separately. – [d]Not treated in tables and diagrams.

Table 3.2 — Mainland China's Pre- and Post-WTO Accession Tariff Rates (as Modeled)

Sectors	Model base rates	Accession rates	New bound rates
MERCHANDISE			
Wool	14.76	42.00	38.00
Natural fibers (cotton etc.)	3.14	17.38	13.58
Primary food production	58.80	58.13	46.83
Other primary production	0.48	6.94	5.08
Sugar	29.49	30.00	20.00
Processed food, tobacco, and beverages	37.65	40.66	23.18
Textiles	25.09	25.43	10.21
Wearing apparel	31.75	32.80	16.05
Leather products	12.10	20.94	17.02
Chemicals, refinery products, rubber, plastics	12.62	14.85	7.17
Steel refinery products	9.68	8.92	5.10
Non-ferrous metal products	7.83	8.20	5.52
Motor vehicles and parts	34.42	38.65	15.41
motor vehicles	70.50	70.50	25.00
parts	23.40	23.40	10.00
Electronic machinery and equipment	11.93	16.90	9.62
Other machinery and equipment	12.83	15.37	10.14
Other manufactured goods	14.51	21.99	16.29
SERVICES			
Wholesale and retail trade services	0.00	NA	0.00
Transportation services (land, water, air)	3.97	NA	1.99
Communications services	9.18	NA	4.59
Construction	13.68	NA	6.84
Finance, insurance, and real estate services	8.08	NA	4.04
Other commercial services	47.92	NA	23.96
Other services (public, health, etc.)	25.74	NA	12.87

Note: services barriers are based on gravity equation estimates. Accession rates reflect an assumed 50% drop in cross-border trading cost estimates.

Source: China WTO accession schedule, GTAP data, and Office of the US Trade Representative. Gravity estimates are based on trade and macroeconomic data and cross-country regressions. See Francois and Spinanger (2001).

Table 4.1
Impact of Greater China Accession on Output (percent change)

	A	B	C	D=A+B	E=A+C
	Elimination of ATC Quotas for WTO Members, Mainland China, and Chinese Taipei	Mainland China and Chinese Taipei Accession, without auto sector restructuring	Mainland China and Chinese Taipei Accession, with auto sector restructuring	Total Impact without auto sector restructuring	Total Impact with auto sector restructuring
Wool	12.80	18.26	16.84	33.40	31.79
Other natural fibers	12.11	17.86	16.41	32.13	30.51
Primary Food	-0.43	-1.03	-0.92	-1.46	-1.34
Other Primary Production	-2.60	-3.57	-3.33	-6.07	-5.84
Sugar	-2.26	-7.93	-8.48	-10.01	-10.55
Processed Foods	-1.02	-4.66	-4.74	-5.63	-5.71
Textiles	13.93	32.00	30.57	50.39	48.75
Clothing	50.26	75.46	73.03	163.65	159.98
Leather Goods	-7.18	5.36	3.51	-2.20	-3.92
Chemicals, Rubber, & Refineries	-2.03	-4.53	-4.27	-6.46	-6.21
Primary Steel	-3.99	-9.13	-7.86	-12.76	-11.54
Primary Nonferrous metals	-5.42	-9.24	-8.94	-14.16	-13.87
Motor Vehicles and Parts	**-4.11**	**-36.68**	**7.99**	**-39.28**	**3.54**
Electronics	-5.06	-3.91	-4.43	-8.77	-9.26
Other Machinery & Equipment	-3.80	-5.39	-4.84	-8.98	-8.46
Other Manufactures	-2.16	-0.34	0.14	-2.49	-2.02
Wholesale & Retail Trade	-0.25	1.39	1.93	1.14	1.68
Transport Services	-1.94	-1.95	-1.39	-3.85	-3.31
Communications	-0.51	0.06	0.99	-0.45	0.47
Construction	0.75	2.81	4.17	3.58	4.95
Finance, Insurance, & Real Estate	-0.65	-0.40	0.22	-1.05	-0.44
Commercial Services	-0.78	-5.85	-5.41	-6.58	-6.15
Other Services	0.00	0.46	1.23	0.46	1.23

Source: Model estimates.

Table 4.2
The Mainland China Motor Vehicle Market (values in millions of 1997 US dollars)

	1997 benchmark	Mainland China and Chinese Taipei Accession, without auto sector restructuring	Mainland China and Chinese Taipei Accession, with auto sector restructuring
values			
Imported motor vehicles and parts, world prices	3,607.71	10,595.68	6,967.97
Imported motor vehicles and parts, internal prices	4,806.39	12,080.71	7,995.72
imported parts, internal prices	1,609.86	2,827.93	5,535.24
imported motor vehicles, internal prices	3,196.53	9,252.78	2,460.48
Domestic autos, intermediates and parts	32,812.46	19,401.89	24,249.56
domestic intermediate parts	10,896.15	4,493.95	5,189.12
industry consumption of motor vehicles	21,625.50	14,698.79	18,785.03
final consumption of motor vehicles	290.81	209.15	275.41
indexes and shares			
Import share of total auto parts (percent of value)	12.87	38.62	51.61
Index of vehicle production	100.00	67.98	102.78
Index of parts production	100.00	41.22	56.28

Table 4.3
China Export Shares – Baseline and Scenario

Export Shares	1997 baseline	Total Impact without auto sector restructuring	Total Impact with auto sector restructuring
Primary	0.046	0.033	0.033
Textile	0.084	0.098	0.097
Clothing	0.102	0.303	0.298
Motor Vehicles and Parts	0.006	0.004	0.019
Electronics	0.133	0.100	0.099
Other Machinery & Equipment	0.146	0.104	0.103
Other Manufactures	0.397	0.294	0.290
Services	0.087	0.062	0.062

Table 5.1 - Location of Automobile Production in China, 2002

Location of Foreign Production

	Producers	Foreign Producers	capacity cars/yr	Production 2002
1	SAIC VW	VW	450 000	278 890
2	SAIC GM	GM	100 000	111 623
3	FAW VW	VW	270 000	158 654
4	FAW Toyota	Toyota/Mazda	70 000	30 165
5	Dongfeng PSA	PSA/Citroen	150 000	84 378
6	Dongfeng Honda	Honda	60 000	59 024
7	Dongfeng Yulong	Nissan/Yulong	60 000	38 897
8	Tianjing Toyota	Toyota	30 000	2 147
9	JIangsu Nanya	Fiat	100 000	23 393
10	SAIC Chery	Daewoo	60 000	49 397
11	Zehjiang Jili	Daewoo (geplant)	150 000	47 443
12	Chongqing Chang'an Suzuki	Suzuki/Yanjin	150 000	67 846
13	Chang'an Ford	Ford	50 000	n.a.
14	Dengfeng Yueda Kia	Kia	50 000	20 080
15	FAW Hainan	Mazda	50 000	11 989
16	Beijing Hyundai	Hyundai	30 000	1 356
17	China Guizhou Aviation Ind.	Wanhong/Chenchang	10 000	1 831
18	Shenyang Brilliant Junbei	BMW (".Halbjahr 2003)	200 000	n.a.
19	Harbin Hafei	Mitsubishi	30 000	14 577
20	Shangdong Yantei	GM	50 000	n.a.
21	Southeast	Zhonghua	60 000	16 935
22	Beijing Jeep	Daimler-Chrysler	85 000	9 052
23	Jinbei GM	GM	30 000	3 751
24	Hunan Changfeng	Mitsubishi	30 000	15 067
25	Zhengzhou Nissan	Nissan	30 000	n.a.
26	Rongcheng Huatai	Hyundai	20 000	n.a.
27	Jiangxi Fuqi	Golden Lion	20 000	n.a.
28	Tianjing Huali	Golden Lion	20 000	n.a.
29	SAIC GM Wuling	GM	150 000	n.a.
30	Sanjiang Renault	Renault	30 000	n.a.
31	Chengdu FAW	Toyota	5 000	n.a.
32	Yizhong	SAIC/RDS	10 000	n.a.

Production capacities in Provinces

	capacity cars/yr	Production 2002
Anhui	60 000	49 397
Bejing	115 000	10 408
Fujian	80 000	16 935
Guandong	120 000	97 921
Guangxi Zhuang	150 000	NV
Guizhou	10 000	1 831
Hainan	50 000	11 989
Heilongjang	30 000	14 577
Henan	30 000	NV
Hubei	180 000	84 378
Jiangsu	130 000	38 460
Jilin	340 000	188 819
Liaoming	230 000	3 751
Shandong	80 000	NV
Shanghai	550 000	390 513
Shanxi	50 000	20 080
Sichuan	205 000	67 846
Tianjing	50 000	2 147
Zehjiang	150 000	47 443
Total	2380 000	1046 495

Oth foreign cos	# emps	# plants
Bosch	3 600	6
Kolbenschmidt	1 500	2
Michelin	4 000	2
ZF/Sachs	2 100	2
Total	11 200	12

Figure 2.1
China's Production of Motor Vehicles since Open-door Policies, thousands

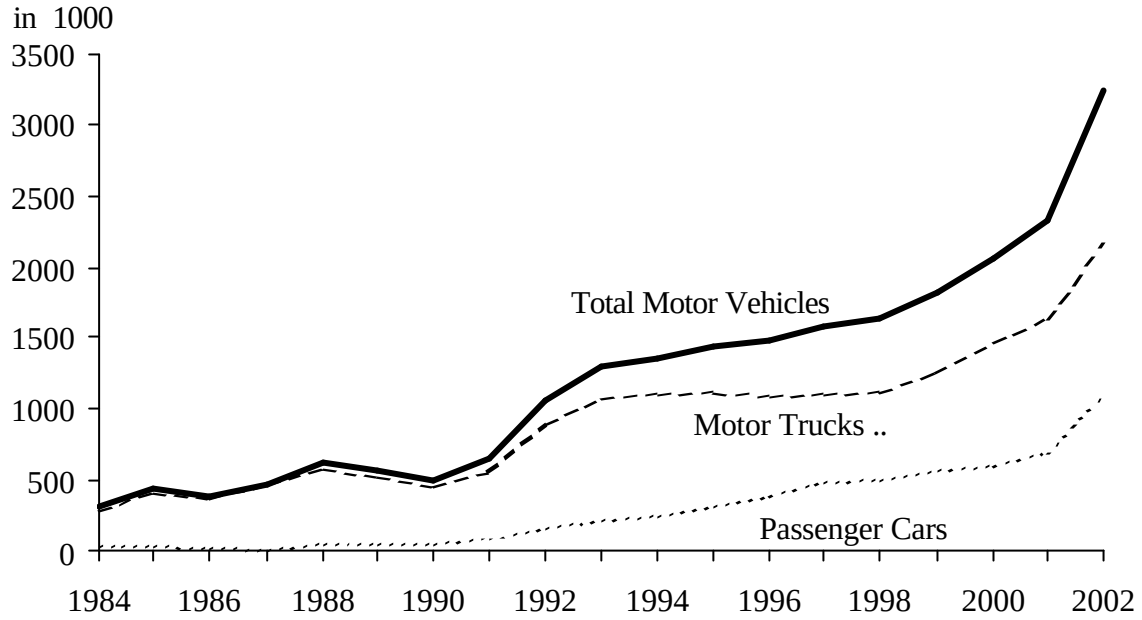
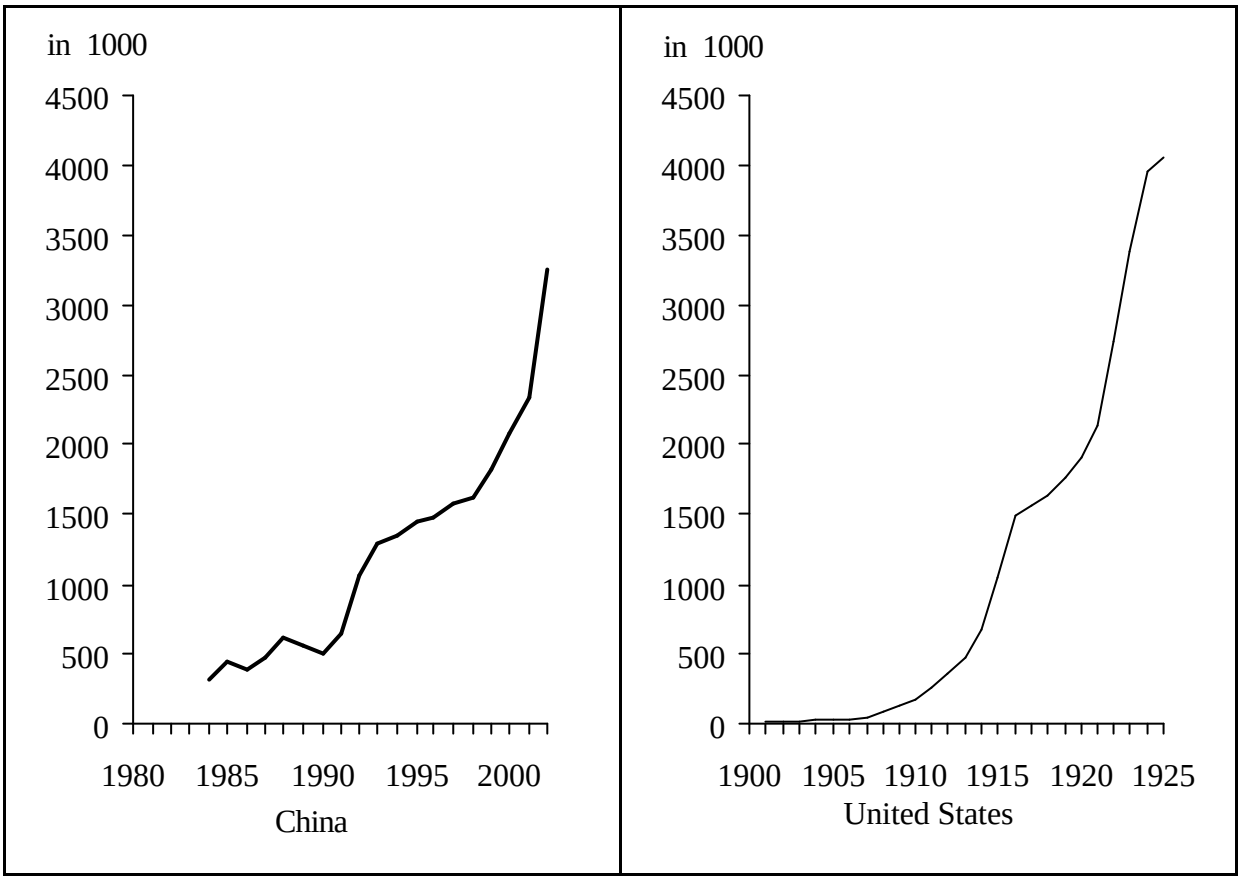


Figure 2.2
Annual Motor Vehicle Production in China and USA



Source: VDA.

Annual production on vertical axis, in thousands.